GLOSSARY

ABBREVIATIONS AND ACRONYMS

ADU	auxiliary drive unit
abs	absolute
AC	alternating current
AGB	accessory gearbox
API	American Petroleum Institute
atm	atmosphere
BDC	bottom dead center
BHP	brake horsepower
BTU	British thermal unit
C	Celsius
cal	calibrated
CDU	central display unit
cyl	cylinder
db	decibel
DC	direct current
ECM	electrochemical machining
ECU	electrical control unit
EDM	electric discharge machining
EGT	exhaust gas temperature
EPR	engine pressure ratio
ESHP	equivalent shaft horsepower
F	Fahrenheit
FAT	free air temperature
FOD	foreign object damage
ft-lb	foot-pound
fps	foot per second
GE	General Electric
hd	head
Hg	mercury
HP	horsepower
HMU	hydromechanical unit
hr	hour
HUD	heads up display
Hz	Hertz
in	inch
lb	pound
LDS	load-demand spindle
LH	left-hand
man	manifold
MGT	measured gas temperature
microsec	microsecond
min	minute
MPH	miles per hour
N	north
NATO	North Atlantic Treaty Organization

OAT	outside air temperature
OD	outside diameter
ODV	overspeed and drain valve
OEI	one engine inoperative
PAS	power-available spindle
PDU	pilot display unit
PRT	power recovery turbine
PRV	pressure regulating valve
psi	pounds per square inch
psig	pounds per square inch gage
PT	power turbine
PTO	power takeoff
RAT	ram air temperature
res	resistance
RH	right-hand
RPM	revolutions per minute
s	south
SAT	static air temperature
SDC	signal data converter
SHP	shaft horsepower
TAT	total air temperature
TC	top center
TCP	tricresyl phosphate
TDC	top dead center
TEL	tetraethyl lead
temp	temperature
TGT	turbine gas temperature
TRQ	torque
VG	variable geometry
VIDS	vertical instrument display system
VS	versus
wt	weight

DEFINITIONS

Acceleration lag – in the turbine engine, delay between the time instant power is requested and when power is available. The time it takes the engine to accelerate and give the required power increase.

Aerodynamic drag – force which thrust must overcome to move an aircraft forward. Design can lesson aerodynamic drag through streamlining. Drag increases with increased speed.

Airbleed actuator – device that operates the interstage bleed system, to improve compressor acceleration characteristics by unloading small amounts of compressed air.

Air density – total mass of air per given volume, the weight of a given volume of air. Air is denser at lower altitude, at lower temperature, and lower humidity.

Airfoil profile – outline of an airfoil section.

Airfoil section – cross section of an airfoil parallel to a specific reference plane.

Air-fuel ratio – Ideal mixture of 15 parts of air to 1 part of fuel by weight; the mixture to be burned in the combustion chamber.

Air inlet – large, smooth aluminum or magnesium duct at mouth of engine which conducts air into the compressor with minimum turbulence and restriction.

Aluminum alloy – any of a variety of alloys formed by combining commercially pure aluminum with other metals or materials such as copper, silicon, manganese, magnesium, and zinc. These alloying agents maybe added singly or in combination to produce a metal with desired characteristics or strength, heat resistance, corrosion resistance, and the like. Both wrought- and cast-aluminum alloys are widely used in the manufacture of rotor blades and aircraft propellers.

Ambient – condition of atmosphere existing around the engine, such as ambient pressure or temperature.

Annular combustion chamber– two-part combustion chamber made up of an annular liner and a housing assembly. The compressed air goes into a ring-shaped space formed by the annular liner around the turbine shaft rather than into individual combustion chambers. The space between the outer liner wall and the housing assembly allows the flow of cooling air. Used with axial-flow and dual compressors.

Annular reverse-flow engine– type of gas turbine engine most commonly used in Army aircraft. Airflow direction is reversed in the combustion area.

Anti-icing system – device that supplies hot air under pressure to prevent icing of the inlet housing areas and inlet guide vanes. Hot scavenged oil is also circulated through internal passages in the walls and struts.

Army Spectrometric Oil Analysis Program (ASOAP) – periodic oil analysis for microscopic metal particles. This takes place at an oil analysis laboratory.

Atmospheric pressure – barometric pressure exerted by the atmosphere as a result of gravitational attraction above the point in question.

Atomizer – nozzle that creates minute particles and accurately shaped spray of fuel suitable for rapid mixing and combustion.

Axial-flow compressor — one in which the air is compressed parallel to the axis of the engine. It is made up of a series of alternating rotor and stator vane stages.

Bending – combination of tension and compression. The inside curve is under compression; the outside is under tension.

Bleed system – device that unloads small amounts of air to relieve pressure.

Boss – raised rim around a hole; e.g., axle hole in a wheel. Circular projection on a casting, usually serving as the seat for a bolt head or nut.

Brayton cycle – constant pressure cycle, with four basic operations which it accomplishes simultaneously and continuously for an uninterrupted flow of power. The turbine engine operates on this cycle.

Camber – the curvature of an airfoil's surfaces from the chord line. It maybe positive, negative, or zero.

Can-annular combustion chamber – one with characteristics of both the annular types. It has an outer shell and a number of individual cylindrical liners.

Can combustion chamber – one made up of individual combustion chambers in which the air from the compressor enters each individual chamber through the adapter.

Center of pressure – aerodynamic center of an airfoil; the point where all forces act.

Centrifugal axial-flow compressor– combination of the centrifugal-flow and the axial-flow compressor. It usually consists of a five- or seven-stage axial-flow compressor and one centrifugal-flow compressor. Also called the dual compressor.

Centrifugal-flow compressor – one with an impeller (rotor), stator, and compressor manifold. The rotor revolves at high speed drawing air into the blades. Centrifugal lforce accelerates the air, and it moves through the stator and through the manifold.

Centrifugal twisting movement – force that tends to streamline rotating blades with the plane of rotation.

Choked nozzle – a nozzle whose flow rate has reached the speed of sound.

Chord line – imaginary line drawn between the leading and trailing edges of an airfoil.

Combustion – process of burning the fuel-air mixture in a gas turbine engine.

Combustion chamber – part of a turbine engine in which the propulsive power is developed by combustion of the injected fuel and the expansive force of the resulting gases.

Combustion chamber liner – engine part usually constructed of welded high-nickel steel, subjected to flame of extremely high temperature. It is behind the compressor and receives the compressed air which is mixed with fuel and ignited. The combustor is where the combustion takes place.

Compressibility effects – the phenomenon encountered at extremely high speeds (near the speed of sound) when air ceases to flow smoothly over the wings (or blade) and piles up against the leading edge, causing extreme buffeting and other effects.

Compressor – that section of an engine that produces an increase in air pressure. It is made up of rotating and stationary vane assemblies. It is the gas producer, or it maybe thought of as an air pump.

Compressor rotor – impeller, may be thought of as an air pump. It accelerates the air rearward into the first stage vane assemblies.

Compressor stall – separation of the airflow from the suction surface of the freed or rotating blades of a compressor. Any degree of stall reduces airflow.

Concave – pressure side of an airfoil.

Conduction – transfer of heat through material by communication of kinetic energy from particle to particle rather than by a flow of heated material.

Convergent area – place where the cross-sectional area of a duct becomes smaller.

Convergent exhaust duct – duct used on fixed-wing aircraft; formed by tapering toward the rear of the duct.

Convex – suction side of an airfoil.

Crossover tube – duct carrying flame to the individual cylindrical liners of the can-annular combustion chamber.

Diffuser – aft structural member of an engine. It receives high velocity air from the centrifugal impeller and decreases velocity and increases air pressure. In the combustor, a diffuser forms a divergent flow path for the exhaust gases.

Diffusion – process by which gases intermingle as the result of their spontaneous movement caused by thermal agitation.

Directional references – specific definitions of terms referring to gas turbine engines to identify front and rear, right and left, bottom and top.

Divergent area – place where air flows from a smaller into a larger area.

Divergent exhaust duct – used on helicopter. Device to diffuse the exhaust gases rearward and to eliminate thrust.

Drag parasite – drag caused by any member or structure which does not contribute to lift, such as engine cowlings.

Drag profile – friction resistance produced by a member moving through the air; in simple terms, the "stickness" of air against the surface of an airfoil.

Dry-cleaning solvent – cleaning compound that maybe used for all metal parts.

Dry-sump engine – one in which the oil is stored separate from the engine.

Dual compressor – see centrifugal-flow, axial-flow compressor.

Duplex nozzle – dual-orifice channel through which highly atomized and accurately shaped sprays of fuel go into the combustion chamber.

Dynamic load – load on an aircraft due to a dynamic force.

Effective angle of attack – that part of a given angle of attack that lies between the chord of an airfoil and a line representing the resultant velocity of the disturber airflow.

End play – longitudinal back-and-forth play of a shaft.

Engine airflow path – route of the airflow through the engine.

Engine oil pressure indicating system – device that gives continuous readings of engine oil pump pressure in psi.

Engine oil temperature indicating system – device electrically connected to the 28 VDC system which transmits temperature readings to the indicator in degrees centigrade.

Engine speed notation – the capital letter N, which represents the rotational speed of the engine. When a number is placed after the N (as in "N_1"), it indicates a specific system on the engine.

Engine stations – specific locations on the engine designating temperature or pressure-measuring locations. For example, T_3 means the third temperature pickup on the engine.

Engine surge – result of compressor stall. The complete engine in stall.

Exhaust – hot gases discharged from the engine through the exhaust diffuser section.

Exhaust diffuser – section composed of an inner and outer housing, separated by hollow struts across the exhaust passage. It forms a divergent flow path for the exhaust gases.

Exhaust gas temperature indicator – sensitive millivoltmeter calibrated in degree centigrade, activated by an electrical force generated by its thermocouple.

Feedback – relay through the controls of aerodynamic forces exerted on the control surfaces and felt by the pilot.

Fir tree mount – manner of attaching the blades to the disk in the turbine rotor assembly. The root of the blade where it is attached to the disk is shaped like a fir tree.

Foreign object – any object such as a tool, piece of equipment, engine part (nut, bolt, lockwire) that could in any way damage the engine.

Foreign object damage – commonly called FOD, harm or destruction to the turbine engine caused by foreign objects sucked into the inlet area of the engine with the required air.

Forged – shaped by hammering. Only the malleable metals are worked successfully. The application of heat increases plasticity.

Free-power turbine engine – the turbine engine used by the Army. Sixty percent of the energy produced by combustion is extracted by the gas producer turbine to drive the gas producer rotor. The rest of the energy is converted to shaft horsepower to drive the output shaft of the engine.

Frictional loss – resistance to the relative motion of air flowing along a duct.

Frontal area – front part of a gas turbine engine, smaller than that of a reciprocating engine, therefore producing less drag.

Front of engine – end from which power is extracted. An exception is the T73 engine on the CH-54, in which the power is extracted at the end where the exhaust gas is expelled.

Fuel-air ratio – see air-fuel ratio.

Fuel atomizer – see atomizer.

Fuel controls – devices to control fuel flow. They are usually hydromechanical and include speed governors, servo systems, valves, metering systems, and sensing pickups.

Fuel divider – device that meters fuel to the engine nozzles according to a predetermined schedule of secondary flow versus primary flow.

Fuel nozzle – device to inject fuel into the combustion chamber in a highly atomized and accurately shaped spray.

Fuel pressure indicating system– device that gives continuous readings in psi of fuel pressure in the main fuel supply line.

Gas producer– the compressor in a free-power turbine engine.

Gas turbine engine – aircraft power plant that is adaptable for both airplanes and helicopters.

Gerotor pump – modified gear-type pump with two moving parts, an inner toothed element and an outer toothed element. The inner one has one less tooth than the outer.

Glow plug – device that consists of a heating element in a short conventional-looking spark plug.

Ground angle – angle between the wing chord and the horizontal plane when the airplane is at rest on the ground.

Heat exchanger – fuel-oil cooler, to help cool the oil. The exchanger is a cylindrical oil chamber surrounded by a jacket through which the fuel passes. Heat from the oil is transferred to the fuel by conduction.

Hot start – overtemperature during starting.

Hung start – failure to reach normal idling RPM during starting.

Igniter plugs – spark plugs which function only during starting and cut out of the circuit as soon as combustion is self-supporting.

Imbalance – uneven distribution of weight resulting in rotating parts being out of balance. Measured in inch-grams or inch-ounces.

Impeller rotor – rotor in a compressor that revolves at high speed, drawing air into the blades.

Induced angle of attack – that part of any given angle of attack in excess of the effective angle of attack.

Induced drag – the part of the total dragon an airplane induced by the airflow about the lifting surfaces.

Inlet guide vanes – devices positioned by the inlet guide vane actuator pilot valve. They are located in front of the first compressor rotor, and they control the angle of incidence of the inlet air, thus ensuring a compressor surge margin.

Inlet housing assembly– forward structural support of the engine.

Jam acceleration – rapid movement of the power lever, calling for maximum rate of rotor-speed increase.

Jetcal analyzer – device used to check the exhaust gas temperature during periodic maintenance inspections or when abnormally high or low temperatures are noted.

Jet propulsion – propulsion of a body by means of a jet or stream of gas, obtaining all or most if its thrust by reaction to the ejection of the combustion products (gas).

Jet silencer – a device used to reduce and change the lower-frequency sound waves emitting from the engine's exhaust nozzle, and thus reducing the noise factor.

Joule – unit of energy or work used in rating gas turbine ignition systems. A joule is equal to the amount of energy expended in one second by an electric current of one ampere through a resistance of one ohm.

Labyrinth seal – device for preventing leakage of gas on the gas generator shaft in a turbine. A labyrinth consists of a series of projections on the rotating element running in close contact with grooves on the stationary element.

Maintenance allocation chart – chart in a -20 TM that assigns maintenance tasks to the lowest level capable of doing them, based on experience, skills, tools, and time available.

Mean aerodynamic chord – chord of an assumed rectangular airfoil representing the mean chord of an actual airfoil.

Metal fatigue – weakening of metal due to microscopic changes in molecular structures caused by vibration or exposure.

Micron – one millionth of a meter.

N_1 system – gas producer.

N_2 system – power turbine and shaft.

Nacelle – an enclosed shelter (cowling) on an aircraft for a power plant.

Nozzle – channel through which gas is conveyed to the rotor vanes of a turbine. Its purpose is to convert pressure into velocity.

Orifice – opening having a closed perimeter through which a fluid may discharge. It may be open to the atmosphere, or it may be partially or completely submerged in the discharged fluid.

Otto cycle – a constant volume cycle, with four distinct operations performed intermittently. Reciprocating engines operate on this cycle.

Outside air temperature – commonly abbreviated as OAT, the temperature of the air outside the engine.

Overspeed – RPM in excess of design; 100 percent RPM.

Overspeed governor, N2 – gearbox mounted on engine inlet housing and driven from the power shaft.

Overspeed governor, fuel control – part of the torquemeter system, an individual pumping unit which, with the tachometer drive assembly, sets the torquemeter oil pressure.

Overtemperature – temperature in excess of maximum allowable design temperature at the turbine exit.

PD 680 – cleaning solvent for exterior of engine and its attached components.

Planform – form or shape of an object, as of an airfoil, as seen in plan view or from above.

Power – the rate of doing work; work per unit of time.

Power-to-weight ratio – relationship between power and weight. Turbine engines produce more power for weight than reciprocating engines.

Power turbine (N_2) – turbine that is free and independent of the gas producer system. It develops rotational shaft power.

Pressure oil system – method of supplying oil under pressure to engine parts.

Pressure pumps – devices to put oil into the system.

Pressurizing and drain dump valve– device to prevent flow of fuel to the nozzle until enough pressure is built up in the fuel control. One also drains the fuel manifold at engine shutdown and traps fuel in the upper portion of the system to keep the fuel control primed for faster starts.

Primary air – air that mixes with fuel in the combustion chamber to form a combustible mixture. The ratio is 15 parts of air to 1 part of fuel.

Radial inflow turbine – type of turbine made by some manufacturers, not used in any Army aircraft today, even though it is rugged and simple, relatively inexpensive, and easy to manufacture. Similar in design and construction to the centrifugal-flow compressor.

Ram – the amount of pressure buildup above ambient pressure at the engine's compressor inlet due to the forward motion of the engine through the air (initial momentum of the air).

Ram air pressure – free stream air pressure, provided by the forward motion of the engine,

Ram ratio – the ratio of ram pressure to ambient pressure.

Ram recovery – the ability of an engine's air inlet duct to take advantage of ram pressure.

Rear of engine – end of engine from which exhaust gas is expelled.

Reverse flow – change in direction of airflow in the combustion chamber of a gas turbine engine.

Rotational direction – direction of movement of the rotating part, determined by viewing the engine from the rear.

Rotational speed – speed at which a propeller, rotor, or some other rotating part rotates; measured in revolutions per minute.

Scavenge oil system – method of returning oil from the engine to the oil tank for cooling and reuse.

Scavenger pumps – those that drain oil from the sumps at various parts of the engine, return it through the oil cooler, and back to the oil tank.

Scoring – multiple scratches, usually parallel and resulting from the same cause.

Secondary air – large surplus of air that cools the hot sections of a gas turbine engine to lower temperatures.

Shaft horsepower (SHP) – energy used to drive the compressor and accessories in a turbine engine.

Shot peening – process used to work-harden metals.

Shroud – device used with turbine rotor to prevent blade tip losses and excessive vibrations. The shrouded blades can be thinner than unprotected ones.

Simplex nozzles – single-orifice channels through which highly atomized and accurately shaped sprays of fuel go into the combustion chamber.

Solvent immersion – cleaning method in which parts are immersed in solvent to remove carbon, gum, grease, and other surface contaminants.

Span – dimension of an airfoil from tip to tip or from root to tip.

Spar – any principal structural member in an airfoil running from tip to tip or root to tip.

Specific heat – the ratio of the thermal capacity of a substance to the thermal capacity of water.

Speed governor – device to relieve the pilot from resetting the power lever when outside air temperature and pressure change. Consists of flyweights balanced by a spring.

Splines – teeth in a gear.

Stable operation – condition where no appreciable fluctuation, intentional or unintentional, is occurring to any of the engine's variables such as RPM, temperature, or pressure.

Standard day conditions – 59ºF, sea level barometric pressure (29.92 inches of mercury).

Static-balanced surface – surface that is in balance about its hinge axis.

Stator – part of assembly that remains stationary with respect to a rotating part. Stator vanes are a stationary set of airfoils in a compressor.

Stress – resultant condition of strain or pressure.

Tachometer generator – device that supplies power at a frequency proportional to the driven speed which drives the synchronous motors in the indicator.

TBO – time between overhauls. This is established by the Army and the engine manufacturer.

Test cell – building, usually concrete, that contains both a control room and an engine room, used for testing engines. The test cell is at the manufacturer's; a mobile engine-test unit is used in the field.

Thermodynamic cycle – succession of processes which involve changes in temperature, pressure, and density in which the substance acts as a means of transformation of energy. See Otto and Brayton cycles.

Thrust – a reaction force in pounds.

Thrust, gross – the thrust developed by the engine, not taking into consideration any presence of initial-air-mass momentum.

Thrust, net – the effective thrust developed by the engine during flight, taking into consideration the initial momentum of the air mass prior to entering the influence of the engine.

Thrust, reverser – a device used to partially reverse the flow of the engine's nozzle discharge gases and thus create a thrust force in the rearward direction.

Thrust, specific fuel consumption – the fuel that the engine must burn per hour to generate 1 pound of thrust.

Thrust, static – same as gross thrust without any initial airmass momentum present due to the engine's static condition.

Torque – a force, multiplied by its lever arm, acting at right angles to an axis.

Torquemeter – hydromechanical torque-measuring device located in the reduction-gear section of the inlet housing. The measurement is read as torque oil pressure in psi.

Torquemeter indicating system – pressure indicator for continuous readings of engine output-shaft torque.

Transient conditions – conditions which may occur briefly while accelerating or decelerating or while passing through a specific range of engine operation.

Turbine nozzle – stationary nozzle which discharges a jet of gas against the blades on the periphery of a turbine wheel.

Turbine rotor – rotating portion of a turbine engine. It is made of specially alloyed steel because of severe centrifugal loads, the result of high rotational speeds.

Turbine section – part of the turbine engine that extracts the kinetic energy of the expanding gases and transforms it into shaft horsepower.

Turbojet – engine most commonly used in high-speed, high-altitude aircraft.

Vapor blasting – abrasive method used to clean combustor parts. Not to be used on ceramic, magnesium, painted, or aluminum surfaces.

Vapor decreasing – cleaning method used on unpainted metal parts or aluminum-painted steel parts.

Vaporizing tubes – devices used instead of fuel nozzles in a T53-L-11 engine.

Variable inlet guide vanes – devices located in front of the first compressor rotor to guide the angle of incidence of the inlet air to the first compressor rotor.

Vermatherm element – device which senses outlet fuel temperature and closes the core valve and opens the bypass valve.

Vibration meter – device for measuring vibrations.